



Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS**0625/42**

Paper 4 Extended Theory

March 2019

MARK SCHEME

Maximum Mark: 80

Published

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This document consists of **11** printed pages.



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Question	Answer	Marks
1(a)	Rate of change of speed OR change of speed / time OR $\Delta v / t$ OR $(v - u) / t$	B1
1(b)(i)	1 Acceleration OR increasing speed OR going faster	B1
	2 Constant speed OR steady speed	B1
	3 Deceleration OR decreasing speed OR slowing down	B1
1(b)(ii)	1 Total distance / total time OR 300/40	C1
	7.5 m/s	A1
	2 Change of distance / change of time OR $(250 - 70) / (30 - 15)$ OR 180/15	C1
	12 m/s	A1

Question	Answer	Marks
2(a)	<u>Advantage</u> : No fossil fuel used OR No fuel costs OR No pollution of air / water OR No polluting gases OR is a renewable energy source OR doesn't contribute to global warming / greenhouse effect	B1
	<u>Disadvantage</u> : Wind not always blowing OR causes noise pollution OR causes visual pollution OR is danger to wildlife OR is expensive to build	B1
2(b)(i)	1 $d = m/V$ in any form, symbols or words OR 24 000 $\times$ 1.3	C1
	31 000 kg	A1
	2 $KE = \frac{1}{2} mv^2$ OR $\frac{1}{2} \times 31\,200 \times 16^2$	C1
	4.0×10^6 J	A1

Question	Answer	Marks
2(b)(ii)	Speed of air not reduced to zero (in passing through turbine) OR some air passes through blade area without change of speed OR without hitting blades OR not all k.e. of air transfers to blades OR air retains some of its k.e. OR friction in bearings of blades	B1

Question	Answer	Marks
3(a)	Accelerate or increase speed OR Decelerate or decrease speed OR Change speed	B1
	Change direction OR causes rotation	B1
3(b)	Sensible scale stated	B1
	T vectors, labelled T or with arrow, both of same length, drawn at right angles (any orientation)	B1
	Triangle or parallelogram completed using candidate's T vectors	B1
	Correct orientation vector diagram with 360 N vector vertical	B1
	T value stated: 250 or 260 N	B1

Question	Answer	Marks
4(a)(i)	Vacuum OR nothing OR mercury vapour	B1
4(a)(ii)	$P = h\rho g$ in any form OR $(h =) P/\rho g$ OR $1.02 \times 10^5 / (13600 \times 10)$	C1
	0.75 m	A1

Question	Answer	Marks
4(a)(iii)	Same vertical height (of mercury)	M1
	Pressure due to column of liquid depends on vertical height OR in formula $P = h\rho g$, h is vertical height OR the pressure remains constant because ρ and g don't change, nor does h .	
4(b)	Air is present in the space labelled S OR above the mercury in the tube	M1
	This air exerts a (downward) pressure on the mercury	A1

Question	Answer	Marks
5(a)	0 °C and 100 °C	B1
5(b)(i)	1 Has uniform / linear expansion OR Has equal expansion for each degree of temperature rise	B1
	2 Has <u>capillary</u> / <u>tube</u> of constant cross-sectional area / diameter / radius / bore / width / thickness	B1
5(b)(ii)	(Compared with thermometer B) A has a <u>capillary</u> / <u>tube</u> of greater cross-section / diameter / radius / width OR A contains a liquid with less expansion per degree / unit temp. rise OR A is longer than B OR A has a smaller bulb	B1
5(b)(iii)	(Compared with thermometer D) C (has capillary / tube that is) narrower / of smaller cross-section / thinner OR has a larger bulb OR bulb containing more liquid OR contains a liquid with greater expansion per degree / unit temp. rise OR contains alcohol instead of mercury	B1

Question	Answer	Marks
5(c)(i)	Diagram to show: Three wires labelled e.g. copper, iron, copper or with symbols for metals OR metal A, metal B, metal A	B1
	One junction between different metals	B1
	Connections to voltmeter / ammeter / galvanometer identified by V, A, G, mV, mA or arrow in a circle	B1
5(c)(ii)	Measurement of: a (very) high or (very) low temperature OR a rapidly varying temperature OR a high range of temperature If values given, more than 300 °C; less than –200 °C	B1

Question	Answer	Marks
6(a)	Convection	B1
6(b)(i)	(E =) $mc\Delta\theta$ OR $65 \times 720 \times 7$	C1
	3.3×10^5 (J)	C1
	$P = E/t$ in any form OR $(t=) E/P$ OR $3.3 \times 10^6 / 1.5 \times 10^3$	C1
	220 s	A1
6(b)(ii)	Two of: The heater warms walls, floor, ceiling, windows, furniture / objects. Thermal energy conducted through walls, floor, ceiling, windows (to exterior) Thermal energy used to raise temperature of air entering room via draughts / openings	B2

Question	Answer	Marks
7(a)	1. Solid to liquid	B1
	2. Liquid to gas / vapour	B1
7(b)	(Neighbouring) molecules of solid have (strong) forces of attraction between them OR Gas molecules have no / weak forces of attraction between them	B1
	Easier to increase separation of gas molecules (than solid molecules) (gas expands more easily so) gas molecules move farther apart	B1
7(c)	PV = constant OR $P_1V_1 = P_2V_2$ OR $0.012 \times 1.8 \times 10^6 = V_2 \times 1.0 \times 10^5$	C1
	$V_2 = 0.216 \text{ m}^3$ OR 0.22 m^3	A1
	(Volume of escaped gas = $0.22 - 0.012 =$) 0.21 m^3	B1

Question	Answer	Marks
8(a)(i)	Wavefronts in the air: Parallel to each other	B1
	Make a larger angle with the boundary than wavefronts in ice and from top left to bottom right	B1
	At least one wavefront meets a wavefront in ice at the boundary	B1
	Arrows at right angles to wavefronts pointing away from boundary	B1
8(a)(iii)	Acute angle between any wavefront in ice and boundary marked <i>i</i> Acute angle between any wavefront in air and boundary marked <i>r</i>	B1
	OR In ice, normal at boundary and ray perpendicular to any wavefront both drawn. Angle between normal and ray in ice marked <i>i</i> . In air, normal at boundary and ray perpendicular to any wavefront both drawn. Angle between normal and ray in air marked <i>r</i> .	(B1)

Question	Answer	Marks
8(b)	$n = \text{speed in air} / \text{speed in ice}$ OR $n = V_{\text{AIR}} / V_{\text{ICE}}$ OR $(V_{\text{ICE}}) = V_{\text{AIR}} / n$ OR $3.0 \times 10^8 / 1.3$	C1
	$2.3 \times 10^8 \text{ m/s}$	A1

Question	Answer	Marks
9(a)	$I = V/R$ in any form OR $(R =) V/I$ OR $7.0 / 4.6$	C1
	1.5Ω	A1
9(b)	Resistor: resistance is constant	B1
	Thermistor: resistance decreases	B1
9(c)(i)	$4.6 + 4.6$	C1
	9.2 A	A1
	OR	(C1)
	Combined resistance = $(1.52^2 / ((1.52 + 1.52) =) 0.76 \Omega$ ($I =) 7.0 / 0.76 = 9.2 \text{ A}$	(A1)
9(c)(ii)	($E =) IVt$ OR in words OR $9.2 \times 7 \times 5 \times 60$	C1
	19000 J	A1

Question	Answer	Marks
10(a)	If voltage is (very) high, current is (very) low NOT if resistance is low	B1
	(If current is low,) thermal energy generated / power loss is low	B1
	(If current is low:) thinner / lighter / cheaper transmission cables / cables with less resistance / cheaper pylons can be used / cheaper	B1
10(b)(i)	$V_p / V_s = N_p / N_s$ in any form OR ($N_s =$) $N_p V_s / V_p$ OR $4000 \times 9 / 120$ ($N_s =$) 300	C1
10(b)(ii)	Iron or soft iron	A1
		B1

Question	Answer	Marks
11(a)(i)	Nucleon number for Pt: 194	B1
	Proton number for Pt: 78	B1
	Symbol for beta particle: ${}^0_{-1}\beta$	B1
11(a)(ii)	After 1 half-life / 19 hrs, count rate = $1100 / 2 = 550$ counts / min	C1
	After 2 half-lives / 38 hrs, count rate = $550 / 2 = 275$ counts / min	A1
	OR 38 hrs = 2 half-lives	(C1)
	After 38 hrs / 2 half-lives, count rate = $1100 / 4 = 275$ counts / min	(A1)

Question	Answer	Marks
11(b)	Two of: <u>γ-emission</u> electromagnetic radiation / travels at the speed of light uncharged no mass long range in air stopped by many cm of lead / very penetrating low ionisation (of air) leaves proton number unchanged not deflected in electric / magnetic field <u>β-emission</u> particles / electrons (negatively) charged has mass shorter range in air stopped by a few mm of aluminium higher ionisation (of air) proton number changes deflected in electric / magnetic field	B2